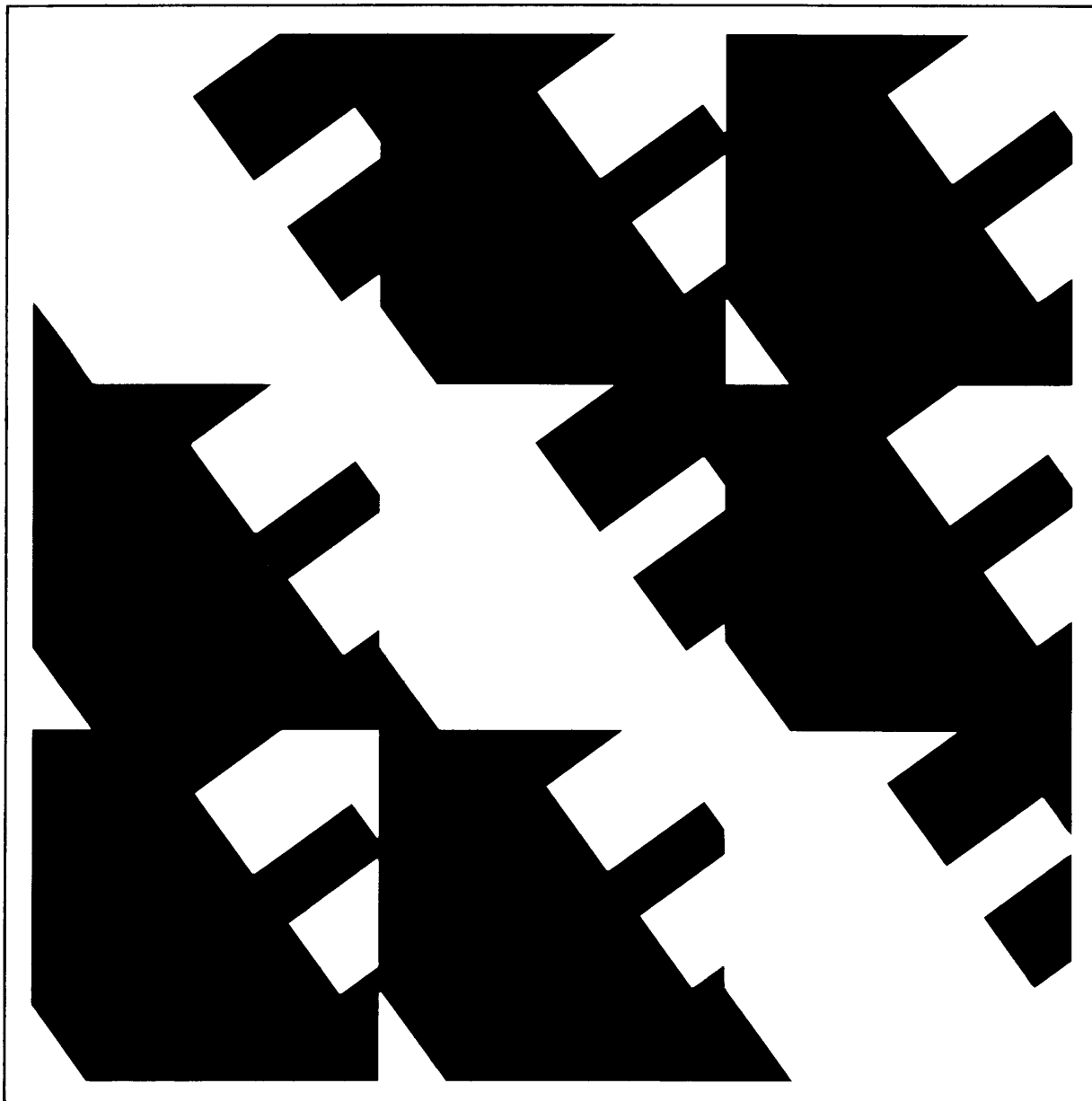


– IEEE Standard Application of the
Single-Failure Criterion to
Nuclear Power Generating Station
Safety Systems

ANSI/IEEE Std 379-1988



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An American National Standard
**IEEE Standard Application of the
Single-Failure Criterion to
Nuclear Power Generating Station Safety Systems**

Sponsor
**Nuclear Power Engineering Committee
of the
IEEE Power Engineering Society**

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Foreword

(This Foreword is not a part of the ANSI/IEEE Std 379-1988, IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems.)

The requirement for nuclear power generating station safety systems to meet a single-failure criterion is found in many documents, including standards of the Institute of Electrical and Electronics Engineers (IEEE), the American Nuclear Society (ANS), and in federal regulations. It is the intention of this document to be in conformance specifically with the requirements of ANSI/IEEE Std 603-1980, to interpret the single-failure criterion as stated in that document, and provide guidance in its application. It is recognized that the single-failure criterion is applicable to the aggregate of electrical and mechanical systems; however, the criterion statement, as found in this document, has been developed for electrical systems. Where the interface with mechanical systems is unavoidable (for example, sensing lines), the mechanical portions are considered to be part of the electrical system with which they interface. It should be noted that the systems include the actuation and protection systems as well as the electrical power system.

Several areas that are not developed by this standard due to its limited scope are noted here:

Relationships with other guides and standards: Other guides and standards should be incorporated in any good design in order to produce an acceptable and reliable system. The relationship of the single-failure criterion to these other guides and standards, documentation requirements, reliability and probability studies, testing, and operation is not within the scope of this standard.

Shared systems: This standard, in the present revision, describes the manner in which the single-failure criterion should be applied to shared systems. It is not intended to either endorse or to forbid the use of shared systems, but rather to provide minimum requirements that will assure that shared systems will be analyzed as rigorously for the effects of component failures as they would be if sharing were not used.

The application of the single-failure criterion to shared systems was previously included in the Foreword to this standard, instead of the body, because consensus could not be achieved regarding the adequacy of this position and the implied justification for sharing systems. Therefore, the Nuclear Power Engineering Committee (NPEC) directed that this section be removed from the document and appointed an ad hoc committee to develop recommendations on shared systems. The single-failure criterion, as it applies to shared systems, has been approved by the ad hoc committee and by NPEC and is now included in the body of this standard. The additional requirements imposed by the ad hoc committee are deemed by the working group that prepared this standard to be outside the scope of this standard. They are included below for information:

“Shared structures, systems, and components are permissible in multi-unit generating stations provided:

1. Minimum engineered safety features are available for each design basis event or combination of events. Sharing systems shall not impair the ability to perform required safety functions.
2. It is demonstrated that design basis events occurring in one unit do not impair the ability to perform required safety functions in the other unit.
3. The single-failure criterion is met.”

The ad hoc committee recommended to NPEC that these requirements be included in appropriate IEEE standards and revisions.

The state of the art is limiting in other areas related to the single-failure criterion. Examples include the following:

Single-operator error: Operator actions should be considered but are beyond the scope of this document. A separate subcommittee within IEEE/NPEC is developing recommendations and criteria for single-operator error and their findings will be published in a separate document.

Common-cause failures: Common-cause failures are multiple failures resulting from a single cause and are frequently characterized by, but not limited to, the failure of identical components.

Common-cause failures can be the result of a number of causes such as external environmental effects, including natural phenomena such as earthquakes and floods, design and manufacturing errors, and operator and maintenance errors.